

Listing of Claims:

Claim 1 (currently amended): A method of forming a toughened article comprising the steps of:

- (a) forming a solids blend comprising a thermoplastic polymer and a comb copolymer;
- (b) heating and mixing said solids blend to form a melt blend; and
- (c) shaping said melt blend to form an article; and
- (d) cooling said article to room temperature;

wherein said comb copolymer comprises:

a backbone; and

as polymerized units, at least one macromonomer comprising a graft segment; and

wherein said graft segment has a degree of polymerization of 10 to 1,000; and

wherein said macromonomer is a macromonomer produced by aqueous emulsion polymerization.

Claim 2 (canceled without prejudice)

Claim 3 (original): The method of claim 1, wherein said comb copolymer is present in an amount sufficient that said article has an impact resistance energy increased at least 15 percent compared to a second article formed identically, absent said comb copolymer.

Claim 4 (original): The method of claim 1, wherein said thermoplastic polymer is a polymer selected from the group consisting of poly(vinyl halide), ABS terpolymer, poly(styrene-acrylonitrile), poly(styrene-acrylonitrile-acrylate), polyaromatics, poly(vinyl acetate), poly(vinyl methyl ether), chlorinated polyethylene, phenoxy (polyhydroxypropylether of bisphenol A), poly(methyl methacrylate), poly(styrene-maleic anhydride), poly(ethylene-vinyl acetate), polyesters, polyamides, polyacetal, polyurethane, polyolefins, polycarbonate, and combinations thereof.

Claim 5 (original): The method of claim 1, wherein said thermoplastic polymer is poly(vinyl chloride).

Claim 6 (original): The method of claim 1, wherein said backbone is immiscible with said thermoplastic polymer.

DN 01269A US

Claim 7 (canceled without prejudice)

Claim 8 (original): The method of claim 1, wherein said graft segment and said backbone are in a weight ratio of 10:90 to 60:40.

Claim 9 (currently amended): A method of forming a toughened article wherein said method comprises the steps of:

- (A) forming a macromonomer aqueous emulsion comprising a plurality of water-insoluble particles of macromonomer, wherein:
 - (i) said macromonomer comprises polymerized units of at least one first ethylenically unsaturated monomer;
 - (ii) said macromonomer is produced by aqueous emulsion polymerization; and
 - (iii) said macromonomer further has:
 - (a) a degree of polymerization of from 10 to 1000; and
 - (b) at least one terminal ethylenically unsaturated group;
- (B) forming a monomer composition comprising at least one second ethylenically unsaturated monomer;
- (C) combining at least a portion of said macromonomer aqueous emulsion and at least a portion of said monomer composition to form a polymerization reaction mixture;
- (D) polymerizing said macromonomer with said second ethylenically unsaturated monomer in the presence of an initiator to produce said plurality of comb copolymer particles;
- (E) isolating said comb copolymer particles to form a solid comb copolymer;
- (F) forming a solids blend comprising a thermoplastic polymer and said solid comb copolymer;
- (G) heating and mixing said solids blend to form a melt blend; and
- (H) shaping said melt blend to form said article; and
- (I) cooling said article to room temperature.

Claim 10. (canceled without prejudice)

Claim 11 (original): The method of claim 9, wherein said comb copolymer is present in an amount sufficient that said article has an impact resistance energy increased at least 15 percent compared to a second article formed identically, absent said comb copolymer.

DN 01269A US

Claim 12 (original): The method of claim 9, wherein said thermoplastic polymer is a polymer selected from the group consisting of poly(vinyl halide), ABS terpolymer, poly(styrene-acrylonitrile), poly(styrene-acrylonitrile-acrylate), polyaromatics, poly(vinyl acetate), poly(vinyl methyl ether), chlorinated polyethylene, phenoxy (polyhydroxypropylether of bisphenol A), poly(methyl methacrylate), poly(styrene-maleic anhydride), poly(ethylene-vinyl acetate), polyesters, polyamides, polyacetal, polyurethane, polyolefins, polycarbonate, and combinations thereof.

Claim 13 (original): The method of claim 9, wherein said thermoplastic polymer is poly(vinyl chloride).

Claim 14 (original): The method of claim 9, wherein said backbone is immiscible with said thermoplastic polymer.

Claim 15 (original): The method of claim 9, wherein said graft segment is miscible with said thermoplastic polymer.

Claim 16 (canceled without prejudice)

Claim 17 (original): The method of claim 9, wherein said backbone has a glass transition temperature of -80°C to 0°C.

Claim 18 (original): The method of claim 9, wherein said graft segment has a glass transition temperature of 50°C to 180°C.

Claim 19 (original): The method of claim 9, wherein said graft segment and said backbone are in a weight ratio of 10:90 to 60:40.

Claim 20 (original): The method of claim 9, wherein said comb copolymer is present at 2 to 40 parts by weight per 100 parts by weight of said thermoplastic polymer.

Claimed Invention

A first aspect of the claimed invention relates to a method of forming a toughened article comprising the steps of:

(a) forming a solids blend comprising a thermoplastic polymer and a comb copolymer;

(b) heating and mixing said solids blend to form a melt blend; and

(c) shaping said melt blend to form an article; and

(d) cooling said article to room temperature;

wherein said comb copolymer comprises:

a backbone; and

as polymerized units, at least one macromonomer comprising a graft segment;

wherein said graft segment has a degree of polymerization of 10 to 1,000; and

wherein said macromonomer is a macromonomer produced by aqueous emulsion polymerization.

In a second aspect, the claimed invention relates to a method of forming a toughened article wherein said method comprises the steps of:

(A) forming a macromonomer aqueous emulsion comprising a plurality of water-insoluble particles of macromonomer, wherein:

(i) said macromonomer comprises polymerized units of at least one first ethylenically unsaturated monomer;

(ii) said macromonomer is produced by aqueous emulsion polymerization; and

(iii) said macromonomer further has:

(a) a degree of polymerization of from 10 to 1000; and

(b) at least one terminal ethylenically unsaturated group;

(B) forming a monomer composition comprising at least one second ethylenically unsaturated monomer;

DN 01269A US

- (C) combining at least a portion of said macromonomer aqueous emulsion and at least a portion of said monomer composition to form a polymerization reaction mixture;
- (D) polymerizing said macromonomer with said second ethylenically unsaturated monomer in the presence of an initiator to produce said plurality of comb copolymer particles;
- (E) isolating said comb copolymer particles to form a solid comb copolymer;
- (F) forming a solids blend comprising a thermoplastic polymer and said solid comb copolymer;
- (G) heating and mixing said solids blend to form a melt blend;
- (H) shaping said melt blend to form said article; and
- (I) cooling said article to room temperature.